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ABSTRACT

This booklet is the first in a series of six sourcebocks produced by Project MAVIS (Materials Adaptations for Visually Impaired Students in the Social Studies). Designed primarily for teachers, the booklet defines visual impairment and its causes, explains how tc interpret a student's eye report, and reviews aspects of the overall educational plan of the visually impaired student. Chapter one defines visual impairment in terms of concepts such as legal blindness, "low vision" individuals, and "visually limited" individuals. Chapter two identifies four types of visual impairment: reduction in visual acuity (ability to distinguish fine points in a form), restriction of the visual field (due to blind spots or tunnel vision, for example), deficiency in color vision, and problems related to use of vision (i.e., visual motor ability and visual perception). Chapter three discusses seven causes of visual impairment: cataracts, glaucoma, retinal disorders, macular disorders, retrolental fibroplasia, nystagmus, and optic-nerve atrophy. Chapter four explains how the teacher can interpret a child's eye report prepared by an optometrist or opthalmologist. A sample form used by the National Society for the Prevention of Blindness is shown as an example. Chapter five offers general guidelines for developing an educational plan for visually impaired children, stressing the importance of treating them like normal children while at the same time providing necessary adaptations to accomodate their impairment. The booklet concludes with a glossary of 46 terms and an educator's checklist of observable clues to classroom vision problems. (AV)

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Who Is the Visually Impaired Child?

SP 012 976

MAVIS Sourcebook 1

by
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Boulder, Colorado

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Other MAVIS sourcebooks

- Sourcebook 2: *Encouraging Successful Mainstreaming of the Visually Impaired Child*
- Sourcebook 3: *Teaching the Visually Impaired Child in the Regular Classroom*
- Sourcebook 4: *Social Studies for the Visually Impaired Child*
- Sourcebook 5: *Important Concerns in the Education of Visually Impaired Children*
- Sourcebook 6: *Resources for Teaching Social Studies in the Mainstreamed Classroom*

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Project MAVIS
Materials Adaptations for
Visually Impaired Students in the
Social Studies

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1. Defining Visual Impairment

That our school population includes visually impaired children is a fact that we as educators take for granted; the Bureau of Education for the Handicapped estimates that 1 in 1,000 school-age children are visually impaired. But how do we recognize and identify such students? Often we recognize them because of the thick glasses they wear or the white canes they use. Not all children with visual impairments are so immediately identifiable, however. Many do not even wear glasses; still more read regular print in spite of their vision problems. Yet even those children who adapt to their environments with apparent ease may need special services to assist them in their school work and their adjustments to other aspects of society. Given that the term *visually impaired* encompasses individuals having a wide range of vision problems and a variety of special needs, what criteria are used to determine whether a student is visually impaired?

One often-used criterion is the definition of legal blindness. In 1935, the Social Security Act required a definition of blindness for legal and economic purposes. In addition, many national, state, and local agencies needed some way of certifying that a person's vision was so poor that he or she could be declared eligible for special programs for the blind. The need for a uniform standard was clear. The result was the following definition of legal blindness, which continues to be used in essentially the same form today: "When a person has visual acuity of 20/200 in the better eye with best correction, or a visual angle of 20 degrees or less, that person is legally blind."

What does this definition mean? Let's look at it piece by piece.

"Visual acuity" means sharpness of vision. For example, the 20/20 line of an eye chart is what the average person can see at 20 feet. The big "E" on the eye chart is usually on the 20/200 line. This means that what the legally blind person can see at 20 feet, the average person can see at 200 feet.

Use of the term "better eye" in the definition means that a person with poor vision in one eye cannot be classified as legally blind if the other eye is good. Thus the person who has 20/200 visual acuity in one eye and 20/20 in the other eye has no legal visual impairment, even though he or she may have difficulty seeing on one side or using both eyes together.

"With best correction" means with glasses or contact lenses. Low-vision magnification aids used by people with subnormal vision do not affect this criterion for legal blindness.

"Visual angle of 20 degrees or less" refers to a visual field limitation. If a line is drawn from the eye to a distant object, a person who can see a field of 20 degrees or less from the object (who lacks peripheral or side vision) would be classified as legally blind.

Although the official definition of legal blindness is generally used for classification purposes, there are some exceptions, particularly among school agencies. Many state educational departments use an operational definition of visual impairment; i.e., they regard a student as visually impaired if that student's vision problem, even with best correction, interferes with normal learning through the sense of vision. Thus, such a student, although not legally blind, is entitled to whatever special education services are needed in order to learn to fullest capacity. Other states have adopted definitions for the partially sighted; these definitions are generally similar to that for legal blindness, with minimum figures specified for visual acuity (usually 20/70) and visual angle.

Clearly, then, students classified as visually impaired for educational purposes vary widely in their visual abilities. Dr. Natalie Barraga of the University of Texas at Austin classifies visually impaired children into three groups.* According to Dr. Barraga, the term *blind* refers to children who have no vision or who have only light perception without projection. Educationally, these children learn through braille and related methods. Using light as an aid in moving around is the only purposeful way such children can use their visual input. *Low vision* children have severely limited vision, but are able to see objects and materials at very close range. Such children are able to use vision in school situations in which assistance is provided in the form of large-print materials or special low-vision aids; however, tactile materials and braille may be needed to supplement visual materials. *Visually limited* children may have difficulty seeing materials without special lighting, or they may need special optical aids or large print. These children can learn visually, however, and thus should always be considered "seeing" children.

*Natalie Barraga, *Visual Handicaps and Learning* (Belmont, California: Wadsworth, 1976).

2. Types of Visual Impairment

Within the wide range of visual abilities found among visually impaired students, what are the major ways in which vision may be impaired?

Basically, visual impairments fall into three major categories: reduction in visual acuity, restriction of the visual field, and deficiency in color vision. Figure 1, which shows the parts of the eye, may be helpful in understanding the following discussion of various defects.

Figure 1
Parts of the Eye

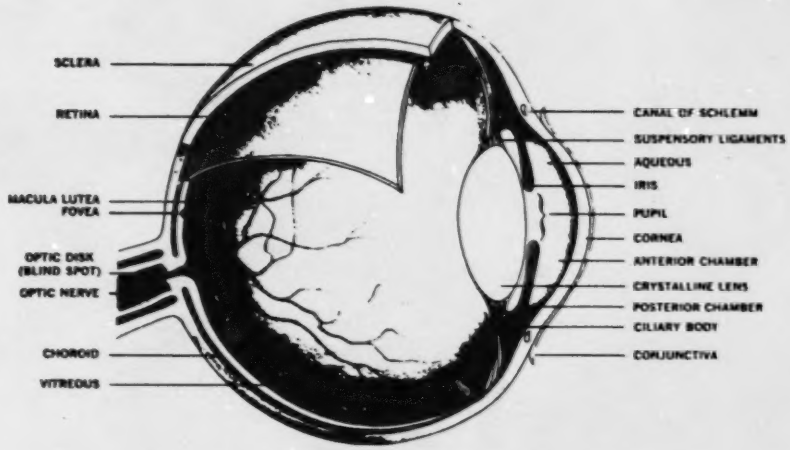


Illustration courtesy of the American Optometric Association.

Reduction in Visual Acuity

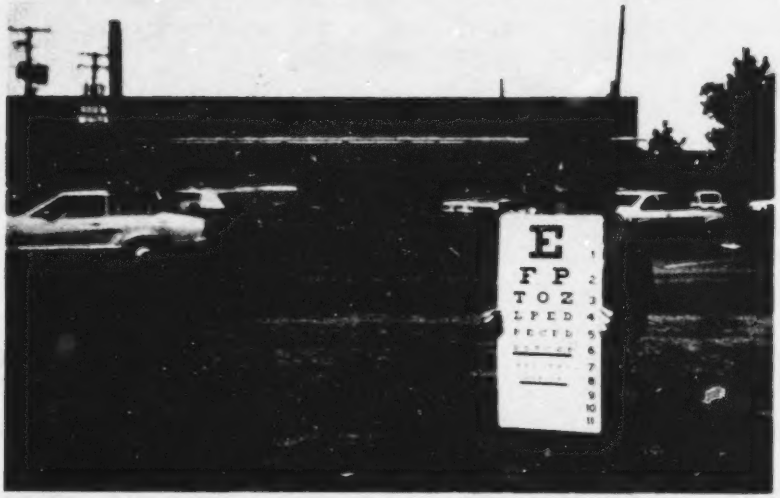
Visual acuity is part of the area of sensation; that is, getting something from outside into the brain. Visual sensations fall into three areas: (1) the ability to distinguish light from dark, (2) the ability to distinguish colors, and (3) the ability to distinguish form. Visual acuity—the ability to distinguish fine points in the form—is part of this third area.

The technique most widely used in the United States to measure visual acuity is based on work done in the Netherlands in 1862 by Herman Snellen. Snellen wanted to establish a comparison norm for visual acuity. Using an associate whose vision he believed to be normal, Snellen determined that a line of print a certain size should be readable from a distance of 20 feet. "Normal" vision was thus recorded as 20/20. If letters identifiable to the person with normal vision at 40 feet were only perceptible to another person at a distance of 20 feet, the latter person was said to have 20/40 vision. By the same measurement, a legally blind person (with best correction) could only see at 20 feet what a person with normal vision could see at 200 feet. Since few if any eye practitioners were equipped with 200-foot-long rooms, larger letters of varying sizes were added to the chart to permit the viewing distance to remain constant, generally 20 feet. In countries using the metric system, 6 meters may be used as the standard distance; thus, normal vision would be 6/6. Figures 2, 3, and 4 simulate what is seen by persons with visual acuities of 20/20, 20/40, and 20/200, respectively.

Figure 2
View as Seen by Person with 20/20 Vision

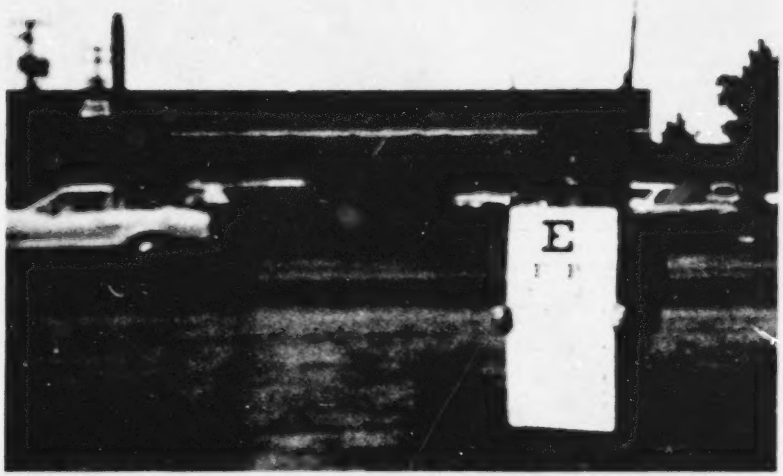
Not only can most of the letters be read, the person holding the chart and the background objects are sharp and distinct.

Figure 3
View as Seen by Person with 20/40 Vision



The lower lines of the chart are indistinguishable, and the background is fuzzy. The effect is that of a TV set that needs adjusting.

Figure 4
View as Seen by Person with 20/200 Vision



All the letters except the top one are indecipherable. Although objects in the background are distinguishable, much of the detail is lacking.

Figure 4 gives some indication of the extent to which some people who are legally blind can actually see. Such people can function visually in many ways. If they are walking down the street, they may not be able to see the facial expressions of passers-by, but they can see cars coming. Their biggest problem might be reading street signs.

Restriction of the Visual Field

Reductions in visual acuity affect the central part of a person's vision; other areas of the visual field may also have defects. These defects result in restrictions of the visual field.

Everyone has a normal "blind spot" in each eye at the point where the optic nerve enters the back of the eyeball and there are no receptors in the retina. However, we are seldom aware of these gaps in our vision because when both eyes are used together, each eye compensates for the other's blind spot. Even when we are squinting or covering up one eye, our brain "fills in" the blind area with whatever we expect to be there. (To determine where your own blind spots are, follow the directions in the caption for Figure 5.)

Figure 5
Finding Your Blind Spots

Directions: Hold the page at eye level about 10 inches from your face. Close your right eye and focus on the "X" at right. The "X" on the left may disappear immediately; if you can still see it, slowly move the page farther away from your face until it disappears, keeping your left eye focused on the "X" at right. When the "X" disappears, it is in your left-eye blind spot. Follow the same procedure to find your right-eye blind spot, closing your left eye and focusing on the "X" at left.

Many visually impaired people have a reduction of the vision field caused by abnormal blind spots—the result of scars from infections or injuries or of incomplete development of parts of the eye. (Figure 6 shows how the scene in Figure 7 might appear to someone with abnormal blind spots.)

Just as persons with normal vision automatically compensate for their blind spots by "filling in" with the opposite eye or by subconsciously using their imaginations, a person with abnormal blind spots may adapt for vision field loss by adjusting posture or holding objects in an unusual manner. The specific area of visual-field loss determines the kind of adaptive strategies that such a person needs to use.

In working with a child who has a restricted visual field, it is important to understand the location and nature of the vision loss so that the best use can be made of what vision exists. For example, a child with right-side vision loss should be seated at the extreme right of the classroom, and the teacher (and classmates) should make an effort to remain on the child's left during conversation and other kinds of interaction. Children with losses in the lower part of the visual field may have difficulty in going up and down stairs. They may need to be taught to hold their heads down while walking up and down stairs.

Figure 6
View as Seen by Person with Abnormal Blind Spots

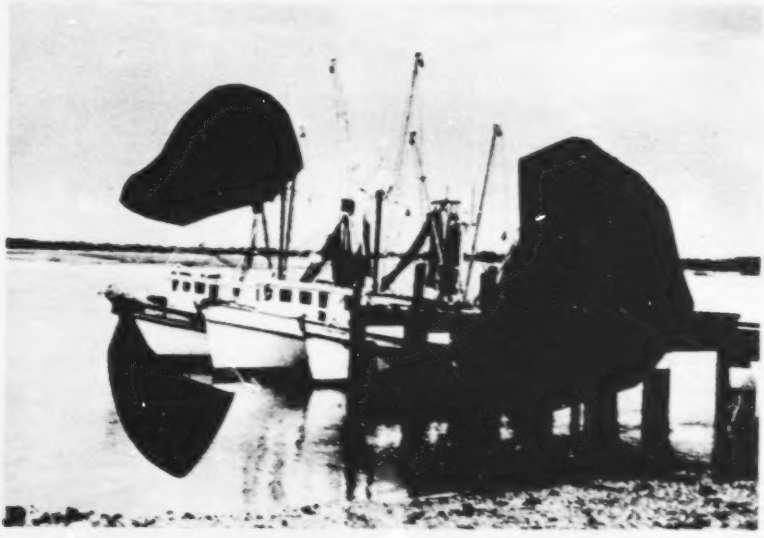
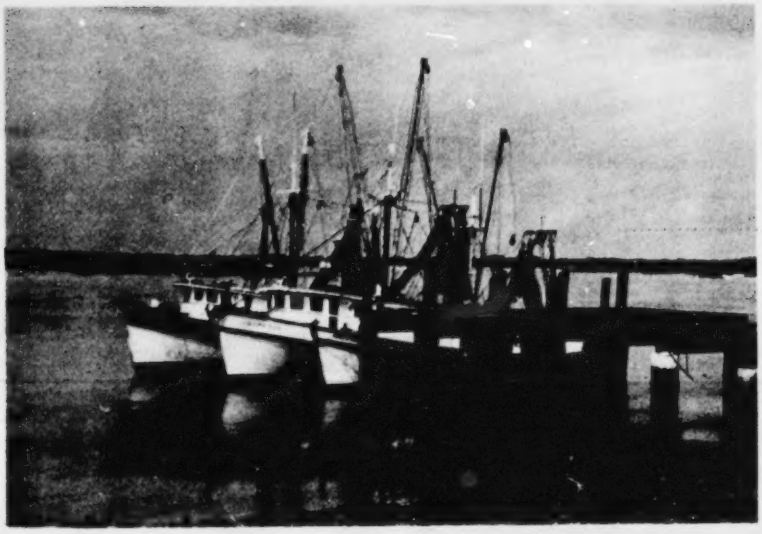


Figure 7
View as Seen by Person with Normal Vision



Another type of visual-field impairment is sometimes called *tunnel vision*. A person with tunnel vision can only see straight ahead; there is very little side vision (see Figure 8). A child with this problem can generally see the chalkboard and read regular-print textbooks unless the visual field is so narrow that the child cannot see a complete word. One of the biggest problems in tunnel vision is walking around, since the child must be constantly alert in order to keep from bumping into objects.

Retinal defects that cause loss of side vision also produce night blindness and difficulty in seeing in areas of low illumination; thus, these problems often occur together.

The reverse of tunnel vision is loss of the central visual field (see Figure 9). Mobility can also be a problem for people with this type of vision loss.

Deficiency in Color Vision

The third general type of visual impairment—deficiency in color vision—is not as serious as loss of visual acuity or restriction of the visual field. Most students whose only vision problem is color deficiency function well in school and do not require special services. However, such activities as color-matching tasks and map reading may require modifications

Figure 8
View in Figure 7 as Seen by Person with Tunnel Vision

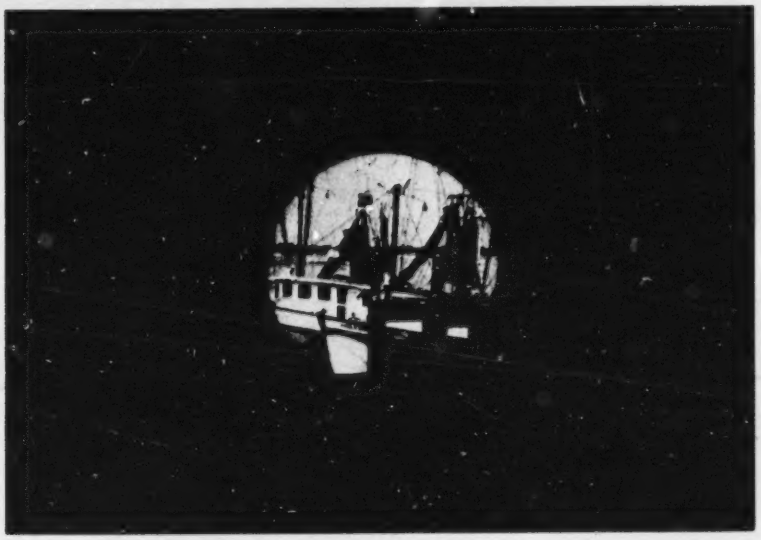
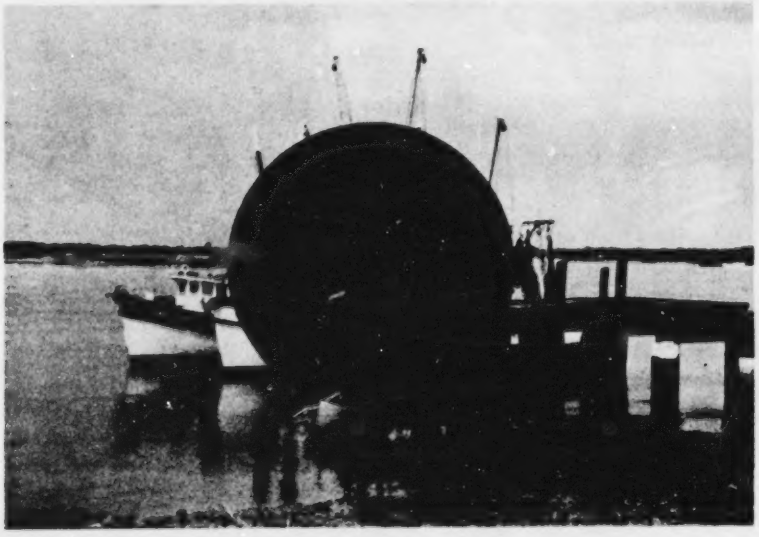


Figure 9
View in Figure 7 as Seen by Person with Loss of Central Vision



for these children. The itinerant or resource teacher probably can supply help or advice in making such changes.

Color is detected by the cones of the retina; the image is then passed through the optic nerve to the brain. Any defect in this system will result in deficient color vision.

There is still some disagreement among theorists on exactly how people see colors. Eight percent of all males have some degree of color deficiency, while only half of 1 percent of females have color deficiencies. This significant difference is due to the fact that color deficiency is usually hereditary; most color defects are passed on the chromosome that determines the male sex.

The term *color deficiency* is used rather than *color blindness* because very few people have no color vision whatsoever. Most people with color deficiencies confuse two or more colors—for example, red and green. Unfortunately, there is no way to cure color deficiency, and no satisfactory system of glasses that corrects it has been developed. Although color deficiencies are sometimes associated with other kinds of visual impairment, no connection has been proven between color deficiency and such other problems as depth perception and learning disabilities.

Color deficiencies can be detected by a set of tests that use colors within a picture. For instance, in one test colors are blended in such a way that a person with normal color vision will be able to see a number on the picture; persons with color deficiencies cannot see this number. By varying the colors used in the pictures, the type and extent of the color deficiency can be determined.

A skill related to but somewhat different from the ability to distinguish colors is the ability to perceive differences in shadings. Special tests can also rate a person's skills in color shading.

One of the main educational concerns for students with color deficiencies is in the area of career education. Students should become aware that some occupations require the ability to color code or to distinguish colors. Other jobs require excellent color shading skills. These factors should be explained to the child with a color vision problem.

Problems Related to Use of Vision

Two other aspects of the use of vision can cause difficulties. *Visual motor ability* refers to the ability to "aim" one's eyes at the item to be viewed; difficulty in this area is sometimes related to other vision problems.

The other aspect of use of vision that may cause difficulty is *visual perception*; that is, the ability to understand and use the information that comes through the eyes. The eyes are simply sensory organs. They transmit an image to the brain via the optic nerve; the brain interprets the message. This process can be compared to a television system; the television camera (eye) picks up an image, the cable (optic nerve) transmits

it, and the monitor (brain) rearranges the picture into a meaningful whole.

Because a newborn baby makes little use of visual perception, it was once thought that infants could not see. We now know that their visual acuity and visual systems are virtually intact at birth; however, because infants cannot understand and use what they see, we can't be certain that they are seeing. Perception must be learned through experience. This fact is one reason for providing children with enrichment experiences—reading to them, taking them places, showing them things. Through such activities, they will acquire a rich variety of visual experiences and thus make better use of their eyes.

In the past, it was thought that visually impaired children could not use their eyes in any way; programs for the visually impaired therefore stressed auditory learning and braille, even with children who had some residual vision. Educational research, however, has shown that when the maximum use of residual vision is made, visual skills improve. Therefore, even children with severe visual impairments should be encouraged to develop their perceptual abilities. Although the degree to which residual vision can be developed varies—some students are eventually able to learn to use regular print; others may develop only enough vision for traveling—even minimum use of residual vision is important for self-help skills.

3. Causes of Visual Impairments

Many eye disorders can cause or contribute to visual impairment. The most common disorders are described in this section.

Cataracts

A *cataract* affects the crystalline lens of the eye, which is directly behind the pupil. This structure is normally transparent; with a cataract, however, some cloudiness or opacity in the crystalline lens or its capsule occurs, resulting in a partial or complete loss of vision (see Figure 10).

Figure 10
Cataract in the Crystalline Lens

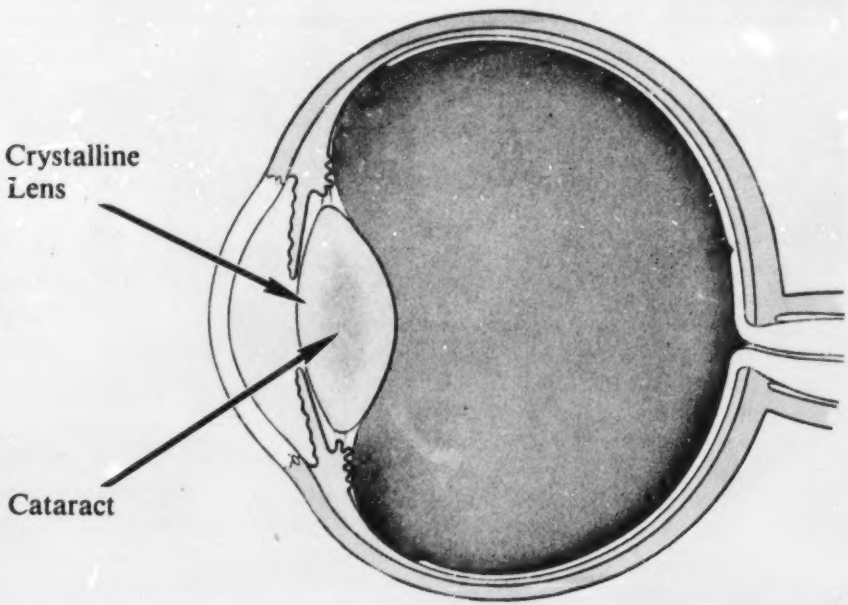


Illustration courtesy of the American Optometric Association.

Cataracts that are present at birth, called *congenital cataracts,* are often caused by a virus—for example, rubella (German measles)—acquired by the mother during the first trimester of pregnancy.

Traumatic cataracts can be caused by injuries to the eye from blows or sharp instruments.

In older people, developmental changes may cause the crystalline lens to degenerate and become cloudy. This condition, called *senile cataract,* is by far the most common type in this country.

If a cataract condition advances to a point at which vision is severely affected, surgery is generally required. During cataract surgery, part or all of the crystalline lens is removed. After the lens has been removed, its refractive power must be replaced by glasses or contact lenses. Occasionally, if the cataract is small and in the central part of the vision, the eye can be dilated so that the person can see around the affected part and have much improved vision without surgery.

There is usually no loss of side vision with cataracts or resulting surgery. However, if cataract glasses are worn, their thick lenses and the edges of the frames may block some side vision. People who wear cataract glasses may also experience some visual distortion, although new advances have improved the optical qualities of such lenses. Because the part of the eye that changes focus is removed during cataract surgery, most people need bifocals after this operation.

Glaucoma

Another major cause of visual impairment is *glaucoma,* which results from increased pressure in the eyeball caused by interference with the circulation of the fluid in the eye. Such interference may in turn result from either a congenital defect or some other disorder—for example, an inflammation elsewhere in the eye.

There are two major types of glaucoma: open-angle and closed-angle. In *open-angle glaucoma,* the pressure builds up slowly with few or no symptoms until it reaches a level at which permanent damage can occur. Seeing haloes around lights at night is an early symptom, as is the frequent need to change lens prescriptions. The eyes of people with early-stage glaucoma often have a steamy, cloudy look. In later stages, there may be some loss of side vision, discomfort, and enlarged normal blind spots. Loss of vision occurs very gradually. There is generally little vision loss until the disease reaches a critical stage.

Closed-angle glaucoma occurs when drainage of fluid is suddenly shut off. The resulting pain is so immediate and intense that prompt attention is needed. Fortunately, medical treatment can in most cases relieve this condition fairly quickly. There is no way to predict the onset of this type of glaucoma without studying the structure of the eye.

Most cases of glaucoma can be treated with eyedrops or other medication, although surgery is sometimes necessary. If a child has a tendency toward glaucoma, teachers and parents should be alert for sudden changes in behavior or vision. Glaucoma is easily identified by examining the eye and measuring the pressure within the eye; such examinations should be regularly given to people who are predisposed to the problem.

Retinal Disorders

Another leading cause of blindness in the United States is retinal disorders. One such disorder, *retinopathy* (which simply means a disease of the retina), usually follows some other condition—for example, diabetes or high blood pressure—which causes hemorrhages on the retina of the eye and deterioration of part of the retina. Although treatment of the primary disorder is crucial, the eye can be treated as well. One new treatment is a laser technique that seals off the damaged blood vessels. Retinopathy is a very serious problem; vision lost as a result of retinopathy usually cannot be restored. Many times the vision loss is gradual and progressive; vision may also fluctuate from time to time.

Retinal detachment occurs when the retina of the eye separates from the next layer. Detachment of the retina may be caused by injury, abnormal thinness of the retina (which permits a hole to develop), or disease.

Retinal detachment results in sudden loss of vision, sometimes affecting only the peripheral area. Treatment should be started as soon as possible because the tissue of the retina will die if it is not reattached. There have been some advances in reattaching the retina by freezing it in place or by using laser beams. Students who have retinal detachments or who are prone to them because of abnormally thin retinas should not participate in such activities as football or diving, in which jolts and bumps to the head are likely. However, they should not be restricted from taking part in normal recess activities.

Retinitis pigmentosa is another type of retinal disorder. This disease is hereditary, and no cure has yet been found. Symptoms do not usually manifest themselves before 10 years of age. The first symptom is night blindness, followed by loss of side vision. Deterioration is progressive; however, the disease may progress very slowly over a period of years, leaving the affected person with usable central vision. Because of the loss of side vision, retinitis pigmentosa affects orientation and mobility.

Since retinitis pigmentosa is an hereditary problem, genetic counseling is advisable. A person with the disease should be advised to enter a profession that can be handled by a person with progressively deteriorating vision. The necessity to change professions due to gradual visual loss could be quite traumatic and damaging to the person's functioning in society.

A small percentage of cases of retinitis pigmentosa are associated with neural deafness. This condition is referred to as Usher's Syndrome and is the largest cause of deaf-blindness among youth and adults. (Among young children, however, rubella is the largest cause of deaf-blindness.) The symptoms of Usher's Syndrome usually do not appear until adolescence or later.

Macular Disorders

The macula of the eye is the area of sharpest vision, the part of the eye with which we see detail. Degeneration of the macula results in diminished visual acuity. Diseases or degeneration caused by heredity may affect the macula. Some cases may be reversed by medical treatment, others cannot be.

The effects of many macular disorders can be alleviated using low-vision aids that spread the image over surrounding areas by magnification; this gives a person improved visual acuity even though the macula may be severely affected. Loss of visual acuity in macular disorders may be sudden or gradual. Vision may fluctuate or remain the same.

Retrolental Fibroplasia

Retrolental fibroplasia, sometimes called RLF, is a disorder in which an abnormal growth of white fibrous material occurs between the retina and the lens of the eye. Such complications as retinal detachment may be caused by this abnormal growth. The disorder is less common today than it was before 1954, when it was found that newborn infants who were given too much oxygen developed RLF. However, some cases still occur.

People affected by RLF have little or no vision, and there is no known treatment. Because RLF causes blindness at a very early age, students with this disorder may also have slowed motor and intellectual development.

Nystagmus

Nystagmus is a rapid, involuntary movement of the eyes that is usually associated with some other disorder—for example, congenital cataract. Nystagmus is always seen in cases of albinism. The pupils of children with albinism may vary in color from almost transparent to a light normal color; there is always a loss of vision, however. Albinos are light-sensitive and should in most cases be shielded from glare or excessive light.

Although decreased central vision accompanies nystagmus, peripheral vision is usually intact. In most cases, low-vision aids significantly improve the visual acuity of persons with nystagmus. Although some experimental treatments for nystagmus have been developed, there is no accepted treatment that works universally.

Optic-Nerve Atrophy

Optic-nerve atrophy and *cortical blindness* are often grouped together; because the optic nerve is really an extension of the brain, a defect in one structure produces the same result as a defect in the other. The optic nerve enters the back of the eyeball to receive impulses from the retina. If there is some defect in the optic nerve or in the cortical area of the brain, there will be visual loss or absence of vision even though the eyeball itself is normal.

Optic-nerve atrophy may be caused by a lesion on the optic nerve or by disease. Loss of vision may be sudden or gradual. There is usually no treatment for optic-nerve atrophy except to treat the disease that caused it, if the atrophy was disease related. Once the optic nerve has become dysfunctional, it generally does not repair itself.

4. Understanding the Student's Eye Report

The information in the preceding sections should be helpful in interpreting the visually impaired student's eye report, which the optometrist or ophthalmologist fills out after examining the child. One commonly used report form is the one supplied by the National Society for the Prevention of Blindness (Figure 11), which contains information about the visual history of the child and about the level of visual acuity in each eye without correction, with best correction, and with low-vision aids, both close up and at a distance. The eye-report form indicates when glasses should be worn and whether a low-vision aid is needed, in addition to giving information about the student's field of vision, the cause of the visual impairment, the prognosis, and recommendations.

Ideally, the information in the eye report should help both parents and teachers better understand a child's visual condition. In many cases, however, the eye report is meaningful only to the doctor. The glossary of terms in the back of this sourcebook may be helpful in interpreting an eye report. However, if an eye report is particularly difficult to interpret, contact the doctor—either in person or by letter—and ask for supplemental information. Questions to ask the doctor might include the following:

—What is the cause of the child's visual impairment?

—Is any special treatment required that the teacher should know about?

—Is the visual impairment likely to get worse, get better, or stay the same?

—Are there any particular symptoms (such as eye rubbing, etc.) that would signal the need for professional attention?

—What restrictions should be placed on the child's activities?

—Should the child wear glasses or contact lenses? If so, when?

—If the child has abnormal blind spots, where are they?

—Is the child able to visually follow a moving object?

—Will the child work better with large or small objects or pictures? At what distances?

—What lighting conditions are best for the child?

—What are your specific recommendations concerning this child's use of vision in learning situations?

—When should the child be examined again?

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Figure 11

CONFIDENTIAL — EYE REPORT FOR CHILDREN WITH VISUAL PROBLEMS — R L B

NAME OF PUPIL (Type or print) _____ (First) _____ (Middle) _____ (Last) _____ SEX _____ RACE _____

ADDRESS: _____ (No. and street) _____ (City or town) _____ (County) _____ (State) _____ DATE OF BIRTH _____ (Month) (Day) (Year)

GRADE _____ SCHOOL _____ ADDRESS _____

I. HISTORY

A. Probable age at onset of vision impairment. Right eye (O.D.) _____ Left eye (O.S.) _____

B. Severe ocular infections, injuries, operations, if any, with age at time of occurrence _____

C. Has pupil's ocular condition occurred in any blood relative(s)? _____ If so, what relationship(s)? _____

II. MEASUREMENTS

(See back of form for preferred notation for recording visual acuity and table of approximate equivalents.)

A. VISUAL ACUITY

	DISTANT VISION			NEAR VISION			PRESCRIPTION		
	Without correction	With best correction*	With low vision aid	Without correction	With best correction*	With low vision aid	Sph.	Cyl.	Axis
Right eye (O.D.)									
Left eye (O.S.)									
Both eyes (O.U.)							Date		

B. If glasses are to be worn, were safety lenses prescribed in: Plastic _____ Tempered glass _____ *with ordinary lenses

C. If low vision aid is prescribed, specify type and recommendations for use. _____

D. FIELD OF VISION: Is there a limitation? _____ If so, record results of test on chart on back of form.

What is the widest diameter (in degrees) of remaining visual field? O.D. _____ O.S. _____

E. Is there impaired color perception? _____ If so, for what color(s)? _____

III. CAUSE OF BLINDNESS OR VISION IMPAIRMENT

A. Present ocular condition(s) responsible for vision impairment: (If more than one, specify all but underline the one which probably first caused severe vision impairment.) O.D. _____ O.S. _____

B. Preceding ocular condition, if any, which led to present condition, or the underlined condition specified in A. O.D. _____ O.S. _____

C. Etiology (underlying cause) of ocular condition primarily responsible for vision impairment (e.g., specific disease, injury, poisoning, heredity or other prenatal influence.) O.D. _____ O.S. _____

D. If etiology is injury or poisoning, indicate circumstances and kind of object or poison involved. _____

IV. PROGNOSIS AND RECOMMENDATIONS

A. Is pupil's vision impairment considered to be: Stable _____ Deteriorating _____ Capable of improvement _____ Uncertain _____

B. What treatment is recommended, if any? _____

C. When is reexamination recommended? _____

D. Glasses: Not needed _____ To be worn constantly _____ For close work only _____ Other (specify) _____

E. Lighting requirements: Average _____ Better than average _____ Less than average _____

F. Use of eyes: Unlimited _____ Limited, as follows _____

G. Physical activity: Unrestricted _____ Restricted, as follows _____

TO BE FORWARDED BY EXAMINER TO:

Date of examination _____

Signature of examiner _____ Degree _____

Address _____

If clinic, rest. Number _____ Name of clinic _____

Illustration courtesy of the National Society for the Prevention of Blindness.

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Figure 11 (continued)

PREFERRED VISUAL ACUITY NOTATIONS

DISTANT VISION. Use Snellen notation with test distance of 20 feet. (Examples: 20/100, 20/60). For acuities less than 20/200 record distance at which 200 foot letter can be recognized as numerator of fraction and 200 as denominator. (Examples: 10/200, 5/200). If the 200 foot letter is not recognized at 1 foot record abbreviation for best distant vision as follows:

HM	HAND MOVEMENTS
PLL	PERCEIVES AND LOCALIZES LIGHT IN ONE OR MORE QUADRANTS
LP	PERCEIVES BUT DOES NOT LOCALIZE LIGHT
No LP	NO LIGHT PERCEPTION

NEAR VISION. Use standard A.M.A. notation and specify best distance at which pupil can read. (Example: 14/70 at 5 in.)

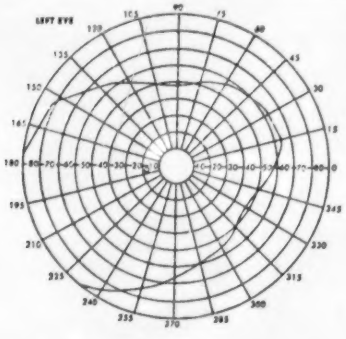
TABLE OF APPROXIMATE EQUIVALENT VISUAL ACUITY NOTATIONS

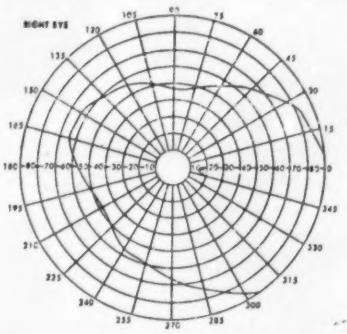
These notations serve only as an indication of the approximate relationship between recordings of distant and near vision and point type sizes. The teacher will find in practice that the pupil's reading performance may vary considerably from the equivalents shown.

Distant Snellen	*Near*			*% Central Visual Efficiency for Near*	*Point*	*Usual Type Text Size*
	A.M.A.	*Jaeger*	*Metric*			
20/20 (ft.)	14/14 (in.)	1	0.37 (M.)	100	3	Mail order catalogue
20/30	14/21	2	0.50	95	5	Want ads
20/40	14/28	4	0.75	90	6	Telephone directory
20/50	14/35	6	0.87	50	8	Newspaper text
20/60	14/42	8	1.00	40	9	Adult text books
20/80	14/56	10	1.50	20	12	Children's books 9-12 yrs
20/100	14/70	11	1.75	15	14	Children's books 6-9 yrs.
20/120	14/84	12	2.00	10	18	Large type text
20/200	14/140	17	3.50	2	24	
12.5/200	14/224	19	5.00	1.5		
8/200	14/336	20	8.00	1		
5/200	14/560					
3/200	14/900					

FIELD OF VISION. Record results on chart below.

Type of test used: _____ Illumination in ft. candles: _____





Test object: Color(s) _____ Size(s) _____ Test object: Color(s) _____ Size(s) _____

Distance(s): _____ Distance(s): _____

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It is particularly important for the classroom teacher to be alert for symptoms that may signal a need for additional professional attention. If any of the following symptoms are observed, further investigation is indicated: constant rubbing of the eyes, loss of side vision, sudden reaction to light and glare, abnormal squinting or contortions in an attempt to see the blackboard, covering one eye, holding materials excessively close at an unusual angle, loss of concentration after using the eyes for a short period, and avoidance of close work. Although these symptoms may not be related to vision, it is best to be cautious.

In interpreting the eye report, remember that visual acuity (sharpness of vision) is not the only factor to be considered; overall visual functioning (how well a person uses his or her visual skills) is perhaps more important. Thus, not only visual acuity but also color perception, adaptation from dark areas to light areas, and use of peripheral or side vision must be considered. Some people who have only a slight loss of visual acuity are greatly impaired because they lack self-confidence and the ability to function effectively in their environment. Others who have a more severe loss of visual acuity make up for this loss by using various kinds of adaptive strategies.

One of the best ways to supplement the eye report is simply to observe the student in normal day-to-day activities. Information gained from such observations can contribute greatly to an understanding of both visual functioning and educational needs. The checklist provided in the appendix to this sourcebook may be helpful in understanding what to look for in observing visual functioning.

Many devices have been developed to help visually impaired children and adults use their residual vision. Understanding the types of aids available is important for the teacher since the eye doctor may recommend a particular aid in the eye report.

Many of these devices are classified as *low-vision aids,* which are usually magnifying devices that amplify residual vision so that it can be used more effectively. Magnification aids may be used for distance viewing—for example, reading material on the chalkboard and watching television—as well as for close-up work. Magnification serves two purposes: (1) a larger image can be seen better and (2) more important, it is spread over a larger area of the retina.

Certain visual problems respond better to low-vision aids than do others. Students with macular degeneration and nystagmus can usually benefit most from low-vision aids, while those with retinitis pigmentosa benefit very little.

Magnification devices may be hand-held, stand-held, or head-held. A head-held device built into a pair of glasses (sometimes called *telescopic spectacles*) frees the hands for other purposes. Some electronic magnification instruments that magnify objects 50 to 100 times can be used with

closed-circuit television to pick up reading material and display it on a television screen.

Selection of a low-vision aid for a particular student depends not only on the vision condition but also on the student's needs and ambitions. For example, a student who is interested in becoming a seamstress or tailor would need a different type of low-vision aid than a student who is interested in entering the field of horticulture. The teacher's knowledge of the student's interests and needs can thus be useful to the doctor who prescribes and fits the aid.

Follow-up services are equally important in determining how effective a low-vision aid will be in helping a student. Teachers and parents should monitor how well and how consistently the student is using the aid. Using a low-vision aid is like learning to see in a new way; many times it is a very difficult process. Teachers and parents must encourage the child not to give up before use of the aid is mastered.

5. The Student's Educational Plan

Development of the educational plan for a visually impaired child is a team effort in which the classroom teacher, vision itinerant or resource teacher, parents, and possibly the school psychologist are involved. The plan should be based on all available information about the child—the optometrist or ophthalmologist's assessment of visual functioning, the parents' and teacher's knowledge of the student's interests and needs, and educational assessments. In developing the educational plan, numerous decisions must be made about need for special equipment and materials, proper lighting level, and other factors.

Because visually impaired students must function in a sighted world where special large-print materials are not always readily available, they should use traditional resources whenever possible. Aside from practical considerations, there are many psychological benefits if a visually impaired student is able to use the same materials that sighted classmates use. Teachers sometimes resist using regular print, inasmuch as large print has been popular for many years. In fact, large print has been overused because some people think that partially sighted students should be using it. This assumption is not true. If a visually impaired student can read regular-size print and feels comfortable with it, that is the material of choice. If a student cannot function effectively with regular print, large print should be chosen.

In developing an educational plan for a visually impaired student and in dealing with that student in the classroom, a teacher should remember that even a severe visual impairment need not permanently influence a child's intelligence. A child who is blind or has a severe visual impairment may have to adapt to new modes of learning—for example, auditory and tactile, rather than visual. If the auditory track is not impaired, communication skills and language development are not generally influenced by blindness. On the other hand, because visual learning generally develops faster than tactile learning, a blind child's development of some gross and fine motor skills may be delayed. With practice and encouragement, however, these skills will develop.

Students with some residual vision may require special materials and assistance in some activities; however, in general they learn to interpret their everyday environment much in the same way that normally sighted students do. Every child with some remaining vision should be encour-

aged to use vision as much as possible in order to become aware of visual stimuli. Such children should be taught to rely on receiving visual signals and to respond in some purposeful manner. Practicing full use of residual vision will help a child function in social and academic situations and will contribute to the development of self-confidence.

Visually impaired children are not radically different from their sighted peers. If they are not overprotected but rather are treated like normal children, with necessary adaptations to accommodate their impairment, the impairment ceases to be the complete handicap it was once thought to be. Given advances in technology which have permitted residual vision to be amplified in many cases, visually impaired students are being released from stereotypic expectations. With the proper guidance and assistance, the horizons for a visually impaired child are almost unlimited.

Glossary

Amblyopia. Dimness of vision in the absence of any apparent disease of the eye.

Astigmatism. Refractive error which prevents light rays from coming to a single focus on the retina because of different degrees of refraction in the various meridians of the eye.

Binocular vision. The ability to use the two eyes simultaneously to focus on the same object and to fuse the two images into a single image which gives a correct interpretation of the object's solidity and position in space.

Cataract. A condition in which the crystalline lens of the eye, its capsule, or both become opaque, with consequent loss of visual acuity.

Choroid. The vascular, intermediate coat which furnishes nourishment to the outer parts of the eyeball.

Congenital. Present at birth.

Cornea. The clear, transparent portion of the outer coat of the eyeball, forming the front of the aqueous chamber.

Crystalline lens. A transparent, colorless body suspended in the front of the eyeball between the aqueous and vitreous chambers, the function of which is to bring the rays of light to a focus on the retina.

Diopter. Unit of measurement of the strength or refractive power of lenses.

Diplopia. The seeing of one object as two (double vision).

Enucleation. The complete surgical removal of the eyeball.

Fundus. The back of the eye which can be seen with an ophthalmoscope.

Fusion. Coordination of the images received by the two eyes into a single mental image.

Glaucoma. Increased pressure inside the eye ("hardening of the eyeball") caused by accumulation of aqueous fluid in the front portion.

Hyperopia, Hypermetropia. A refractive error in which, because the eyeball is short or the refractive power of the lens weak, the point of focus for rays of light from distant objects is behind the retina; thus accommodation to increase the refractive power of the lens is necessary for distant as well as near vision.

Iris. The colored circular membrane suspended behind the cornea immediately in front of the lens. The iris regulates the amount of light entering the eye by changing the size of the pupil.

Ishihara Color Plates Test. A test for defects in recognizing colors, on the basis of ability to trace patterns in a series of multicolored plates.

Jaeger Test. A test for close vision which uses lines of reading matter printed in various sizes of type.

Legally blind. Having visual acuity of 20/200 in the better eye, with best correction, or a visual angle of 20 degrees or less.

Light perception (L.P.). The ability to distinguish light from dark.

Low-vision aids. Optical devices of various types useful to persons with vision impairment.

Macrophthalmos. An abnormally large eyeball, resulting chiefly from infantile glaucoma.

Macula lutea. The small area of the retina that surrounds the fovea and which, with the fovea, comprises the area of distinct vision.

Microphthalmos. An abnormally small eyeball present at birth (congenital).

Myopia (Nearsightedness). A refractive error in which, because the eyeball is too long, the point of focus for rays of light from distant objects is in front of the retina. Thus, to obtain distinct vision, the object must be brought nearer to take advantage of divergent light rays (those from objects less than 20 feet away).

Near-point accommodation. The nearest point at which the eye can perceive an object distinctly. This varies according to the power of accommodation.

Nystagmus. An involuntary rapid movement of the eyeball which may be lateral, vertical, rotary, or mixed.

Oculus dexter (O.D.). Right eye.

Oculus sinister (O.S.). Left eye.

Oculus uterque (O.U.). Both eyes.

Optic disk. The head of the optic nerve in the eyeball.

Optic nerve. The special nerve of the sense of sight which carries messages from the retina to the brain.

Optic-nerve atrophy. Degeneration of the nerve tissue which carries messages from the retina of the eye to the brain.

Peripheral vision. The ability to perceive the presence, motion, or color of objects outside the direct line of vision.

Refractive error. A defect in the eye which prevents light rays from being brought to a single focus exactly on the retina.

Retina. The innermost coat of the eye, formed of sensitive nerve fibers and connected with the optic nerve.

Retinitis pigmentosa. An hereditary degeneration and atrophy of the retina, usually accompanied by misplaced pigment.

Retinopathy. A disease of the retina due to varying causes.

Retrolental fibroplasia (RLF). A disease of the retina in which a mass of scar tissue forms on the back of the lens of the eye. Both eyes are affected in most cases. RLF occurs chiefly in premature infants who receive excessive oxygen.

Sclera. The white part of the eye—a tough covering which, with the cornea, forms the external, protective coat of the eye.

Scotoma. A blind or partially blind area in the visual field.

Snellen chart. A chart used for testing central visual acuity consisting of lines of letters, numbers, or symbols in graded sizes drawn to Snellen measurements, each labeled with the distance at which it can be read by the normal eye.

Strabismus (Squint). Failure of the two eyes to simultaneously direct their gaze at the same object because of muscle imbalance.

Tunnel vision. Loss of side vision.

Vitreous chamber. Transparent, colorless mass of soft, gelatinous material filling the eyeball behind the lens.

Visual perception. The ability to understand and use information obtained through the eyes.

Appendix

EDUCATOR'S CHECKLIST
OBSERVABLE CLUES TO CLASSROOM VISION PROBLEMS

Student's
Name _____ Date _____

1. APPEARANCE OF EYES:
   - One eye turns in or out at any time _____
   - Reddened eyes or lids _____
   - Eyes tear excessively _____
   - Encrusted eyelids _____
   - Frequent styes on lids _____

2. COMPLAINTS WHEN USING EYES AT DESK:
   - Headaches in forehead or temples _____
   - Burning or itching after reading or desk work _____
   - Nausea or dizziness _____
   - Print blurs after reading a short time _____

3. BEHAVIORAL SIGNS OF VISUAL PROBLEMS:
   A. Eye Movement Abilities (Ocular Motility)
      - Head turns as reads across page _____
      - Loses place often during reading _____
      - Needs finger or marker to keep place _____
      - Displays short attention span in reading or copying _____
      - Too frequently omits words _____
      - Repeatedly omits "small" words _____
      - Writes up or down hill on paper _____
      - Rereads or skips lines unknowingly _____
      - Orients drawings poorly on page _____

   B. Eye Teaming Abilities (Binocularity)
      - Complains of seeing double (diplopia) _____
      - Repeats letters within words _____
      - Omits letters, numbers or phrases _____
      - Misaligns digits in number columns _____
      - Squints, closes or covers one eye _____
      - Tilts head extremely while working at desk _____
      - Consistently shows gross postural deviations at all desk activities _____

C. Eye-Hand Coordination Abilities

Must feel of things to assist in any interpretation required _____

Eyes not used to "steer" hand movements (extreme lack of orientation, placement of words or drawings on page) _____

Writes crookedly, poorly spaced; cannot stay on ruled lines _____

Misaligns both horizontal and vertical series of numbers _____

Uses his hand or fingers to keep his place on the page _____

Uses other hand as "spacer" to control spacing and alignment on page _____

Repeatedly confuses left-right directions _____

D. Visual Form Perception (Visual Comparison, Visual Imagery, Visualization)

Mistakes words with same or similar beginnings _____

Fails to recognize the same word in next sentence _____

Reverses letters and/or words in writing and copying _____

Confuses likenesses and minor differences _____

Confuses same word in same sentence _____

Repeatedly confuses similar beginnings and endings of words _____

Fails to visualize what is read either silently or orally _____

Whispers to self for reinforcement while reading silently _____

Returns to "drawing with fingers" to decide likes and differences _____

E. Refractive Status (Nearsighted, Far-sightedness, Focus Problems, etc.)

Comprehension reduces as reading continued; loses interest too quickly _____

Mispronounces similar words as continues reading _____

Blinks excessively at desk tasks and/or reading; not elsewhere _____

Holds books too closely; face too close to desk surface _____

Avoids all possible near-centered tasks _____

Complains of discomfort in tasks that demand visual interpretation _____

Closes or covers one eye when reading or doing desk work _____

Makes errors in copying from chalkboard to paper on desk _____

Makes errors in copying from reference book to notebook _____

Squints to see chalkboard, or requests to move nearer _____

Rubs eyes during or after short periods of visual activity _____

Fatigues easily; blinks to make chalkboard clear up after desk task _____

OBSERVER'S SUGGESTIONS:

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The Foundation suggests that the entire guide, "Educator's Guide to Classroom Vision Problems," be read before the Checklist is administered. Information and copies of the Guide and Checklist or Checklist only may be obtained by writing to the Optometric Extension Program Foundation, Inc., Duncan, Oklahoma 73533.